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Some Aspects of Osteo-Arthritis of the Vertebral Column.*

By W. M. MITCHELL, M.C., M.B., CH.B., B.SC. (Edin.), M.R.C.V.S., Professor of Surgery and Obstetrics, Royal (Dick) Veterinary College, Edinburgh.

Over a year ago I came across a horse, slaughtered for food purposes at the Scottish Zoological Park, whose vertebral column, as far as the thoracic bodies were concerned, was completely ankylosed and showed varying knob-like exostoses projecting into the thoracic cavity.

A portion of the thoracic part of the vertebral column was obtained and boiled and is placed before you as the starting point of my growing interest in clinical aspects of osteo-arthritis, or perhaps it would be better to say ostitis and arthritis, as it affects the vertebral column (specimen exhibited). I have no intention of going into detail of the pathology of osteo-arthritis in this short paper, though it will be necessary for me to try and correlate clinical signs and pathological findings.

From September last I have taken every opportunity of examining horse carcases, more particularly the thoracic and lumbar regions, and the specimens laid out illustrate the diversity of pathological changes occurring in the vertebral column.

The total number of horses destroyed at the Zoo from September to April inclusive was 116, and I have, from 33 of these horses, obtained some portion or other of the vertebral column showing osteo-arthritic changes.

These horses were all aged and therefore the proportion of affected specimens is no doubt unusually high, but nevertheless shows that the condition under discussion is quite common.

It was impossible to make a complete investigation of the whole vertebral column, even if time permitted, as the carcases were required for food purposes, so at first I started collecting specimens of vertebral column from the portion of the carcase where deviations from the normal are easily discovered, *viz.*, from the 6th to 16th Thoracic Vertebræ, as here the bodies have only a covering of pleura on each side.

From the frequency with which specimens were obtained in this region in September, I was led to believe that the Lumbar Vertebræ, with their more complicated articulations associated with the transverse processes of the 4th, 5th and 6th., would in all probability show similar changes.

Remembering that the Lumbo-Sacral plexus of nerves was formed by the ventral roots of the 4th, 5th and 6th Lumbar and 1st and 2nd Sacral nerves, and that the ventral intervertebral foramina, by which the first three of these roots emerge, were in close proximity to joints medially, and laterally, it struck me that the nerves emerging from these foramina were peculiarly liable to suffer from the effects of osteo-arthritic change if these neighbouring joints should ever be affected.

From this deduction I began to wonder if the conditions shivering and stringhalt might be explained in this way.

It so happened that about this time a shiverer came to my notice which I managed to get the Zoo to buy for slaughter and I thus got an opportunity of testing the hypothesis I had formulated. (See Case 1 below.)

I am still waiting for an opportunity to examine a stringhalt case *post-mortem*, though I will give you the history of a case which is suggestive of a causal lesion in the lumbar region.

The conditions known as jinked or sprained back, grunting and broken wind I am also going to discuss briefly, but I fear you will think I am skating on very thin ice in some of my arguments.

SHIVERING.

CASE 1.

History.—A heavy draught gelding, about 16 years old and in somewhat poor condition, came under treatment on account of a large superficial burn on the near thigh, but as the area would have taken a long time to heal and the horse was a marked shiverer in the off hind leg, destruction was advised.

Post-mortem examination.—The carcase when hung up revealed little wrong with the thoracic vertebræ. On removal of the sub-lumbar muscles a large rounded spherical exostosis about 2 in. in diameter was found on the left side, *i.e.* on the opposite side to that in which clonic spasms of the thigh muscles had been noticed, whereas at first glance the other half of the vertebræ appeared normal. More careful dissection, however, showed that the ventral intervertebral foramen between the 4th and 5th Lumbar Vertebræ on the right side was markedly diminished compared with the other side which had the large exostosis and that the ventral root of the 4th Lumbar nerve was definitely compressed by the osteo-arthritic change.

CASE 2.

History.—An aged heavy draught gelding was sent by a firm of brewers for destruction on account of old age, and the slaughterman, whom I had instructed to be on the look out for horses showing signs of shivering or stringhalt, informed me that this particular horse had been noticed to catch up his near hind leg when moved in the stall.

I was able to get in touch with the driver, who had driven the horse during the last ten years, and this is the further history gleaned.

The horse was 23 years old and he said that for the last ten years the horse had been "nerved" in the off hind leg and about a year ago signs of similar trouble

* Presented to the Scottish Metropolitan Division, N.V.M.A., at Blairgowrie, on June 22nd, 1929.

commenced in the near hind leg. The animal became so bad lately that at times he would catch up the leg and almost fall over.

For some time there had been considerable difficulty in backing.

No respiratory trouble had ever been apparent.

Post-mortem examination.

(*a*) Osteo-arthritis of the costo-vertebral articulations was easily seen on inspection of the thoracic part of the spine owing to the marked lipping of the joint margins. These articulations, I find, are a very good guide in determining the likelihood of osteo-arthritic change elsewhere in the body.

(*b*) A very distinctive feature on viewing the carcase was the pale salmon-coloured appearance of the 6th intercostal space on the left side; all other spaces were of a normal reddish brown colour. The pale appearance of this particular space was due to atrophy of the intercostal muscles, and on examination of the vertebral extremity of the space I found that it was filled by osteo-arthritic overgrowth from the two adjacent costo-vertebral articulations completely bridging the space and so involving the intercostal nerve supplying the intercostal muscles. (Specimen exhibited.)

This appears to me to be an excellent example of how osteo-arthritis may produce remote effects on muscles even to the point of complete paralysis.

No other intercostal space showed such a large osteo-arthritic change as this one.

(*c*) Lumbar Vertebræ. (Specimen exhibited.)—This horse possessed no inter-transverse articulations between the 4th and 5th vertebræ.

The most obvious bony change was a rounded bony boss uniting the transverse processes of the 4th and 5th on the left side.

The inter-transverse articulations between the 5th and 6th on both sides showed lipping with encroachment upon the ventral intervertebral foramina.

The bodies of the vertebræ on either side of the articulations between the 3rd and 4th and the 4th and 5th bulged externally so that the depression on either side of the body of the 4th vertebræ was deeper than normal.

Examination of the floor of the vertebral canal showed corresponding slight encroachment on the canal, from osteo-arthritic change of the adjacent ends of the bodies of the 4th and 5th. The vein lying at the side of the dorsal longitudinal ligament on the right side above the 5th vertebra was only about 1/5th the normal diameter.

The general impression gained from consideration of the lumbar region as a whole was that the 5th vertebra had been the chief sufferer in the chronic changes, appearing as if it had had a slight twist on a longitudinal axis running through the centre of the body.

The variety of changes in the vertebral column makes it it difficult to point to any particular site as the cause of the signs shown during life.

Shivering and Grunting.

Case 3.

History.—An aged light draught gelding was sent for destruction with the report that he was a very definite shiverer. When seen by me just before destruction no signs of this could be detected, but I found that the horse was an extraordinarily marked grunter whenever a feint was made to strike him.

The horse walked and trotted quite well and though one might call him a little stiff, was not lame.

Post-mortem. (Specimens exhibited.)

(*a*) Well-marked osteo-arthritis of the costo-vertebral articulations with excellent examples of lipping of the articular margins and corresponding stretching of the joint capsules.

(*b*) The bodies of the thoracic vertebræ from the 6th backwards on either side of the intervertebral junctions appeared to be more prominent than usual. Disarticulation of the 7th and 8th vertebræ showed the *nucleus pulposus* of the intervertebral disc completely absorbed and the bone on the opposing surfaces of the bodies quite bare, only a limited amount of the fibrous ring remaining of the intervertebral disc.

The frayed edges of the disc undergoing absorption were brownish in colour, giving the impression of an active process of necrosis. Succeeding intervertebral discs behind this showed diminishing stages of absorption.

(*c*) Lumbar Vertebræ. Large exostoses encroaching upon the adjacent intervertebral foramina arise from the neighbourhoood of the articulation of the bodies of the 4th and 5th vertebræ.

The ventral intervertebral foramen between the 5th and 6th on the right side was much smaller than on the left, from an exostosis arising from the intertransverse articulation.

(*d*) There was marked extravasation of blood between the fibres of the 6th Lumbar Nerve on both sides, well seen in this nerve before leaving the vertebral canal. (Spinal cord exhibited.)

Stringhalt.

I have no *post-mortem* specimen connected with a known case of stringhalt, but the following detailed history obtained about a case I met last summer is, from the point of view of the subject under discussion, very suggestive.

The subject, which first came under my notice in June, 1928, was a show yard jumper gelding about 14 years old, with definite stringhalt in the near hind leg. In February, 1927, the horse was first noticed lifting the near hind leg. The horse had never been overworked and, going back as far as 1919, there was no history of an accident. Shortly after the stringhalt was noticed the horse was put into training and it was found that the fitter the horse got the more rapidly worse he became, until at times he almost touched his body with his foot.

In the spring of 1924 the owner first noticed that the horse was tender over the loins, more particularly on the near side, and would flinch when mounted.

As time went on the horse became more tender, and flinched when a brush was passed over the loins on the near side and dropped his back badly when mounted, though he gave no evidence of pain afterwards.

The tenderness over the loins disappeared last summer, by coincidence, shortly after I did a Peroneal Tenotomy on the near leg.

It may be of interest to state, in passing, that the operation led to a slight improvement for a short time but the condition was soon as bad as ever.

My latest information is that the horse shows stringhalt

much worse on the off leg than the near when in the stable, but is perfectly normal when out.

The horse is still jumping, but I am looking forward some day to a more intimate investigation of this animal's vertebral column.

"Jinked Back." Sprained Back.

Case 4.

I refer to the condition closely allied to shivering, where an animal has difficulty in backing and tends to sway in his hind quarters as though there were a partial paralysis. Time will not permit me to give details of the *post-mortem* findings in such a case, but a specimen is laid out for inspection, the most interesting point being the almost complete obliteration of the 5th ventral intervertebral foramen. (Specimen exhibited.)

Lumbar Vertebræ showing minor encroachments on foramina.—The cases with which I have already dealt show gross changes of the vertebral column associated with clinical signs and it seemed obvious that there must be many animals whose vertebræ are affected with osteo-arthritis which, if examined, would show lesser degrees of pathological change not likely to cause clinical signs.

I have picked out a series of specimens which I think illustrate this point. (Specimens of lumbar vertebræ from four horses exhibited.)

Evidence that osteo-arthritis of the vertebral column is only a local sign of a more general osteo-arthritic involvement of the skeleton.—I strongly suspect that any animal showing clinical evidence of chronic osteo-arthritic trouble, such as ringbones, sidebones, pedal ostitis, bone spavin, bog spavin, navicular disease, gonitis, etc., will show in a large proportion of cases, if not in all, some degree of similar trouble somewhere in the vertebral column. A sufficient number of cases has not been examined from this point of view for me to be dogmatic, but I have placed alongside vertebral lesions evidence in support of this contention. (Specimens exhibited.)

Discussion.

I think you must all agree, from the figures given and specimens exhibited, that osteo-arthritis affecting the vertebral column is not only fairly common, in old horses at any rate, but also that the lesions are very variable. A pure pathological study of the specimens would have been very interesting, but my object has been to try and connect up clinical signs of some conditions the etiology of which is unknown, with gross pathological findings.

This investigation is obviously very incomplete without considerably more evidence, especially from young animals, and I must confess that my main object in putting forward my views is to gain your help to obtain such animals for further study.

Stringhalt and Shivering.

The cause of the conditions "Stringhalt" and "Shivering" was last investigated in this country, as far as I can gather, by McCall (1) who had the spinal cord and brain examined for degenerations in a case of each, but nothing abnormal was found.

My contention is that shivering and stringhalt are merely signs of osteo-arthritis affecting the vertebral column and that the varying site of muscular spasm depends upon the nerve roots implicated. The greater frequency of signs of these two conditions occurring in the hind limbs depends upon the peculiar anatomical relationship of the intervertebral foramina associated with the last 3 Lumbar nerves which help to form the Lumbo-Sacral plexus.

In the early stages of the osteo-arthritic change no clinical signs are noticeable, then later some irritation of nerve roots develops and the signs of shivering, and to a less extent stringhalt, gradually increase in frequency.

In the worst cases the blood supply to the spinal cord may be interfered with, producing a congestion of the cord, and this would account for the terminal paraplegia sometimes met with in shiverers.

So far no microscopical examination of nerve roots or spinal cord has been carried out to see if there is any degeneration of nerve fibres associated with the suspected factor of osteo-arthritis.

Grunting.

The clinical sign of grunting in a horse has aroused great diversity of opinion among veterinary surgeons as to what significance should be placed upon it in the examination of horses for soundness, and as yet no physical basis has been determined. I put forward, for further investigation, the suggestion that it may be due in a number of cases to chronic osteo-arthritis affecting the articulations between the vertebral extremity of the ribs and the vertebral column and that grunting in such is merely an expression of pain in these joints on the part of the horse, due to sudden fixation of the chest when an examiner feints to strike the animal.

Of all joints in horses affected with osteo-arthritis these stand out pre-eminently as the most commonly affected, which is not to be wondered at, seeing that they are joints which are never at rest so long as the animal is alive.

Broken Wind.

The last condition I wish to pass in review, as possibly being due occasionally to osteo-arthritis of the vertebral column, is "broken wind." I have no evidence from an actual case to go upon, but on looking through a store of old bones recently I found this specimen (exhibited)—a portion of thoracic spine completely ankylosed, and to it are also ankylosed certain ribs.

In such a horse I take it that the movements of the chest wall were *nil* and that the ribs had become fixed at the position of maximum extent of expansion of the chest.

As a result of this the lungs would not be so efficiently emptied and overstretching of the alveoli of the lungs would follow exertion. It is easy to understand also on this basis the abnormal abdominal breathing characteristic of this condition.

If some or all of the various conditions I have passed in review should prove after further study to have close connection with osteo-arthritis, it should be remembered that they will merely be added links to the growing appreciation of the fact that the majority of diseases scheduled under the Horse Breeding Act, and many outside it, are merely local manifestations of a general disease affecting the joints and bones of horses, the pathology of which is common to all.

The etiology of osteo-arthritis affecting the bones and joints of the limbs has led to such argument in the past that I would feign have stirred your minds by throwing doubt upon many of the cherished ideas of heredity embodied in the Horse Breeding Act.

I will content myself by saying that just as nurture and environment will do much to convert a nation from C3 to A1, so also I think they will repay greater consideration in the reduction of osteo-arthritis among horses.

Reference.

(1) "*Stringhalt*" and "*Shivering.*" By J. R. McCall. Proceedings of the 28th General Meeting of the National Veterinary Association, London, 1910.

Discussion.

Mr. T. M. Inglis opened the discussion. He said he wished to thank Professor Mitchell for his admirable address and for the trouble he had taken in preparing it and bringing such a representative collection of pathological specimens to support his claims.

The first thing that struck him was that it was highly essential that they should attempt to follow through to a detailed *post-mortem* more of these bony conditions in horses which they were usually content to condemn and then lose all interest in. He thought that the theory was not new, for he remembered that William Williams recorded two cases of exostosis of the ileum causing stringhalt and that several Continental workers had also associated bony diseases with the well-known nervous condition of shivering. He thought, however, that the address was most stimulating and desired to express his thanks to Professor Mitchell.

Mr. McLaren said that he had come to learn from others rather than to contribute, but that he must obey the ruling of the President, who had asked him to speak. He had listened with great interest to the address and was indebted for having the subject opened up. He thought that though it only dealt with one aspect, it bespoke a lot of labour to have collected the facts and brought the specimens to show them. He had an idea, however, that due allowance must be made for coincidence before importance could always be attached to bony lesions.

It was a simple fact, to his mind, that stringhalt was always hereditary. It might be present before the working stage was reached, and in his opinion it often was. To establish the relationship of the existence of bony lesions in young horses with stringhalt would need much more investigation before the matter was settled. He also desired to thank Professor Mitchell for his paper.

Mr. A. Cumming said that he had run across a number of cases in which old horses had developed shivering when not expected to do so. For this he could not suggest a reason. He would be pleased, however, to send such specimens as he could collect, for further examination.

The first difficulty was that shivering in young horses of three to four years old was very serious and he thought that it was always hereditary. He could not understand how to attribute these cases to the effect of bony lesions; at the same time he thought there was a possibility that, in their early stages, they might have something to do with shivering. He thought the investigation was promising, but he could not see how the inheritance of shivering could be explained by bony lesions, unless it was that the sire or the dam transmitted to their offspring a tendency to the formation of bony deposit in the vertebræ.

Mr. Robson also wished to thank Professor Mitchell for his very interesting address. He thought one of their greatest difficulties was to be able to detect the beginning of these cases of bony new growth in young horses which might be seen lame one day and sound the next. He also would have great pleasure in co-operating in the collection of specimens and he hoped to hear of the continuance of Professor Mitchell's investigation.

Mr. McVean added his thanks to that of the others who had spoken. There were, in his opinion, a large number of three to four-year-old horses which developed shivering for no apparent reason at the time they were put to work or shortly after, and he also had difficulty in understanding how these cases should be attributed to bony lesions. He was determined, however, to attempt elucidation by making more *post-mortem* examinations himself.

He thought that the possibility of "broken wind" being due to exostosis of the heads of ribs, was interesting. Many animals were put out to graze and were brought up again with "broken wind" shortly afterwards. He could not think that in this short period there would be time for the development of bony lesions. He leaned to the opinion that "broken wind" had a good deal to do with the alimentary canal.

Dr. Dryerre thought that an investigation of the influence of the nerves on the growth of bone might throw some light on this subject. It might be coincidence, but there was a basis of fact in that, by irritating a mixed spinal nerve, osteo-arthritis could be induced in young animals. He thought that fibrous tissue might give rise to shivering and that after it had existed for some time fibrous tissue might ossify, giving a bony enlargement. He believed that good environment might improve the quality of bone in the case of rheumatism in man. The cause was usually referred to as intestinal toxæmia, and some toxins had been demonstrated which would irritate bone. Robson found a ferment in irritated bone areas which appeared to remove calcium from the blood and the reaction of the tissue at the site of irritation appeared to have some relationship with the food consumed.

Professor Linton said he would like to ask some questions. Firstly, he thought that shivering and allied diseases were not necessarily hereditary. He would ask, were they transmitted by the female germ cell or were they transmitted by the milk of the dam? Secondly, were they more common in Scotland than in England because brood mares in Scotland were not fed so well as they were in England? Thirdly, were bone diseases ever known in Shetland, Welsh or Exmoor ponies? Fourthly, could those conditions be produced artificially?

Mr. Robertson thought that the address had opened up a new aspect. To his mind, one of the most important questions was, if "broken wind" is due to bony lesions, how does it come about that changes in feeding will either aggravate or alleviate the condition? This was a well-known clinical fact made use of both by livestock owners and veterinary surgeons.

Mr. Nairn thought that these were mainly diseases of the improved breeds in which nurture and hygiene had been of a high quality. He could not understand why good conditions could not prevent these diseases. He was not sure, but he thought that on some of the best limestone grazing they had a large amount of shivering. He knew that certain stallions left more shivering horses behind them than others. He did not believe that shivering was transmitted, but he thought a vulnerability was transmitted. It might be that bony lesions were more the effect than the cause of some of these other associated conditions. Any part of the body which was constantly irritated would commence to deposit calcium. He would like to ask if Professor Mitchell thought that osteo-arthritis began early, because most certainly shiverering mostly commenced in youth; it was not so common for it to commence in old age.

Mr. Stinson, Mr. Blount and others also spoke.

The Reply.

Professor Mitchell said that he was aware of the statement of Williams in connection with exostosis of the ilium as being a possible cause of shivering and admitted that nerve irritation might quite well occasionally occur in this way.

As far as inheritance was concerned, he was strongly inclined to doubt the view that the many osteo-arthritic conditions were hereditary, but as the connection between stringhalt and shivering and osteo-arthritis required further investigation, judgment would have to be reserved regarding them.

He thought that there was a close relationship between many of the various troubles affecting the horse, and that there was some common underlying etiological factor as yet unrecognised. He recalled how foals might develop joint ill and in some cases died quickly, some lingered on and ultimately died, whereas others might partially or completely recover.

Then again, cases were met of foals developing chronic synovial distensions of joints (bog spavin) and tendon sheaths (wind galls) without lameness or apparent general disturbance of health; most remained permanently, but sometimes spontaneous recoveries occurred. Later in life these animals might develop splints, spavins, ringbones, sidebones, etc., and to those he wanted to add stringhalt, shivering and the other conditions mentioned in his paper.

He directed attention to the possible importance of vitamin deficiency being the unknown factor, pointing out that according to tables quoted [Report on the present state of knowledge of Accessory Food Factors (Vitamins). Medical Research Council, Special Report Series, No. 38, 1927. London, H.M. Stationery Office] a ration of oats and hay, the staple and often only ration of horses, from experimental evidence, was deficient in Vitamin C.

In support of this suspicion, mention was made of a recent monograph (Studies on Scurvy. By A. W. Meyer and L. M. McCormack of Stanford University, California, 1928) where guinea-pigs fed on alfalfa hay, rolled barley, and water in abundance developed marked nervous manifestations and permanent as well as temporary locomotor disabilities. Among the many changes observed were marked degenerative changes in cartilages, bones, teeth, muscles, many glandular organs, blood vessels and also the central, peripheral and sympathetic nervous systems.

This diet was conclusively proved to be deficient in Vitamin C, as recoveries followed when affected animals were given tomato juice subcutaneously or fed on tender lettuce leaves, both rich in Vitamin C.

If guinea-pigs could suffer in this way from a lack of Vitamin C, why not horses fed very similarly?

The question of altered methods of feeding relieving broken wind he thought was explained by the fact that anything which would diminish abdominal distension would relieve the abdominal muscles and diaphragm of so much extra work in expiration.

Royal Veterinary College.

The Royal Veterinary College announcement in our advertisement pages discloses the fact that a well-wisher of the College offers £100 to the General Expenses Fund of the institution on condition that five others will give an equivalent sum, and that three have already come forward. We hope that the enthusiasm shown by these gentlemen in helping the cause will stimulate old students to ensure that not only two, but many others will follow their generous example.

* * * * *

In the House of Commons on January 21st, Captain Crookshank asked the Minister of Agriculture if he could make any statement regarding the report on the Royal Veterinary College. Mr. Buxton replied: I am fully aware of the need for urgency in this matter, and discussions between the Government departments and other bodies concerned are being pressed forward. I am not in a position to make any further statement on this subject, but the hon. Member may rest assured that a decision will be reached and made public as soon as possible.

Tribute to Capt. F. J. Sheedy.

A recent issue of the "Tanganyika Times" (British East Africa) contains the following:—

"Dar-es-Salaam is soon to lose two of its popular citizens in Captain and Mrs. Sheedy. Captain F. J. Sheedy, M.B.E., Deputy Director of Veterinary Services, has earned well-merited promotion to the D.V.S.-ship of Malaya, and he and Mrs. Sheedy leave Dar-es-Salaam on January 5th by the "Llangibby Castle" for a short leave in England, prior to his taking up his duties in Malaya. Captain Sheedy has spent 16 years in East Africa, of which 13½ years have been in Tanganyika territory, and we have no doubt that the severance of his interests here will not be accomplished without a big wrench. They will be much missed in social circles, and numerous are the good wishes which go with them."

Captain Sheedy is eldest son of Mr. Thomas Sheedy, Fairview, Cork.

Post-parturient Dyspepsia.*

By Hugh C. Watson, M.R.C.V.S., Strathconon, Ross-shire.

At the outset, I would inform you that I am an inexperienced practitioner thirsting for information, and when asked to read a short paper before this meeting, I decided on the subject of Post-parturient Dyspepsia, not because I am an authority on the condition, but rather that I should like to increase my knowledge of it. A more suitable title might have been "A *Type* of Post-parturient Dyspepsia," as I propose to deal mainly with the form of the disease which I know. I have tried to make myself acquainted with all the information available on the subject, and I am greatly indebted to Professor Pool, of the Moredun Institute, and his librarian for supplying me with literature from the library of the Animal Diseases Research Association. Literature bearing directly on the subject appears to be scanty, but I am hopeful that the recording of your views put forward to-day will make a valuable addition thereto.

Definition.—I would define the condition I intend to discuss as a disease of the post-parturient cow, characterised by a progressive wasting and constipation, accompanied by the presence of an excessive amount of acetone in the bodily secretions and excretions.

Synonyms.—There are various names for the condition, the commonest being "Post-partum Dyspepsia," or "Post-parturient Dyspepsia." Others are "Deferred Milk Fever" and "Retention of the Lochia." In the West of Scotland a common name for the disease is "Staw," while Mr. Lainé, in the *Veterinary Journal*, describes a condition in cows in Guernsey which he terms "Low Fever" or "Slow Fever," the symptoms being similar to those of post-parturient dyspepsia. The most recent term for the disease is "Acetonemia"; it is so-called in the latest edition of Hutyra and Marek. I regret that there is no general homely term for the disease, as it requires courage to tell the average farmer that his cow is afflicted with "Post-parturient Dyspepsia" or "Acetonemia."

Occurrence.—Only the bovine species is affected. The disease usually occurs from two to eight weeks after calving, but most commonly between the second and fourth week. It occurs, as far as I am aware, only in cows which at the time are in the house, and it is common to find that a cow which is once affected is susceptible to another attack at a subsequent parturition. In this district it appears to be most prevalent in byres where cows are kept in small numbers; it is uncommon to find it in large dairy farms. I have not experienced the disease in heifers, and whether or not certain breeds are more susceptible than others is a point on which I invite information.

Etiology.—The actual cause is not known, but one has only to consult Hutyra and Marek's latest edition to find that a sound knowledge of physiology is all that is required to bring forth an abundance of theories all equally sound and incontrovertible but totally different. Recently Messrs. Hudson, of Retford, and Stinson, of Appleby, have expressed their respective views on the cause of the disease; the former supports the theory that in the uterus

* Presented to the Scottish Metropolitan Division, N.V.M.A., at Blairgowrie, on June 22nd, 1929.